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Description

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Method and communication station for transmitting data

5 The invention relates to a method for the error-monitored transmission of data over parallel interfaces of a multi-step communication system having the features in the preamble of claim 1 or, as the case may be, to communication stations for implementing a method of said type.

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In multi-step communication systems, referred to also as multi-hop communication systems, data is transmitted from a transmitting station to an ultimately receiving station either directly or over a multiplicity of intermediate stations or relay stations connected therebetween. As well as being transmitted over a single intermediately connected relay station, said data can also be transmitted over a multiplicity of relay stations connected in series one behind the other, which is referred to also as a multi-hop arrangement. Especially, furthermore, in 15 SFN (SFN: Single Frequency Network) communication systems, one and the same signal, and hence one and the same set of data, can be received by a plurality of relay stations simultaneously or, as the case may be, with a slight delay, and transmitted directly to the receiving station or to a further relay station 20 jointly, which is to say simultaneously or correspondingly slightly delayed and using the same frequency. Preemphasis or deemphasis methods can be employed here in the relay stations to increase the efficiency. In order to ensure error-free data transmission, use is made of various error detection and error 25 correction methods, for example an automatic request to repeat the transmission of an original or modified data packet (ARQ: Automatic Repeat Request), which are known per se from communication systems of said type or from other communication systems. The use of what is termed a cyclic redundancy check (CRC) 30 is also known. Said methods are applied anew to each individual transmission, which is to say to each transmission from the transmitting station to an adjacent relay station, to each 35

transmission from one relay station to another relay station, and to each transmission from a relay station to the receiving station. Although this approach indeed ensures that the data will reach the receiving station as error-free as possible over
5 a maximum number of paths, the high level of computing power and time expenditure associated therewith is disadvantageous. Said approach is furthermore highly energy-intensive since, on the one hand, the unpacking, decoding, and checking of received data in the relay stations and the requesting of a retransmission, or repeated encoding and onward transmission, are processes that consume energy and, on the other hand, the repeated transmission of re-sent data packets finally likewise consumes energy.

15 The object of the invention is to improve a method for the error-monitored transmission of data over parallel interfaces of a multi-step communication system, in terms in particular of the processing effort expended in the overall system, and to propose communication stations for implementing a method of
20 said type.

Said object is achieved by means of a method for the error-monitored transmission of data over parallel interfaces of a multi-step communication system having the features of claim 1
25 or, as the case may be, by means of a communication station having the features of claim 9.

Advantageous embodiments are the subject of dependent claims.

30 Because acknowledgements or, as the case may be, requests to repeat a data transmission are only generated by the receiving station, which is to say as a rule by the last station in the transmission chain, only that station has to monitor received data for satisfactory reception quality. If satisfactory reception quality is detected, also only that station will dispatch
35 a thus generated acknowledgement or, as the case may be, request in the direction of the station originally sending the

Claims

1. Method for transmitting data (D) in a communication system (MHSFN), wherein
 - 5 - the data (D) is transmitted from a transmitting station (SS) to a data-receiving station (RS) receiving the data (D) over at least two relay stations (HS1,HS2,HS) in each case receiving and forwarding the data, and
 - the data (D) will be retransmitted in the event of unsatisfactory transmission due to a request from the receiver side and/or due to the absence of an acknowledgement (ACK) from the receiver side
 - 10 characterized in that
 - the request or, as the case may be, acknowledgement (ACK) is only generated and sent back to the transmitting station (SS)
 - 15 by the receiving station (RS).
2. Method according to claim 1, wherein
 - at least one of the relay stations (HS2) checks received data
 - 20 (D) for unsatisfactory reception and, depending on the outcome of the check, forwards or does not forward said data (D) and/or, depending on the outcome of the check, breaks off the data connection (V22) routed over it without a renewed request to the transmitting station (SS).
- 25 3. Method according to claim 1 or 2, wherein
 - the data (D) is only transmitted over one of the relay stations (HS1,HS3) which has received the data (D) sufficiently well.
- 30 4. Method according to claim 2 or 3, wherein
 - error correction methods (ARQ,CRC) or error detection methods are applied in at least one of the relay stations (HS2,HS3) prior to the forwarding of received data (D) for the purpose of detecting the data which has been received sufficiently well or
 - 35 unsatisfactorily.

5. Method according to a preceding claim, wherein
in at least one relay station (HS2) the forwarding of received
data (D) is carried out or not carried out depending on an own
reception quality and depending on information about reception
5 quality from at least one parallel relay station (HS3).

6. Method according to a preceding claim, wherein
the transmitting station (SS), the receiving station (RS), and
at least some of the relay stations (HS1-HS3) belong to a com-
10 munication system (MHSFN) communicating on a single frequency.

7. Method according to a preceding claim, wherein
the data (D) is forwarded over different parallel paths embod-
ied via different relay stations (HS1;HS2;HS3), with said data
15 (D) being processed, in particular preemphasized and/or deem-
phasized, decoded and/or encoded, in the relay stations.

8. Method according to a preceding claim, wherein
the data (D) transmitted in parallel over different paths is
20 received overlaid on the receiver side and processed jointly.

9. Communication station (RS,SS,HS1,HS2,HS3) for implementing a
method according to claim 1, wherein
a communication station embodied as a relay station (HS1-HS3)
25 has

- a receiving device (R) for receiving data (D) requiring to be
forwarded,
- an analyzing device (A) for analyzing said data (D) with re-
gard to its reception quality, and
- 30 - a transmitting device (S) for forwarding the data (D) depend-
ing on the result in the analyzing device.